



**COMPRESSOR
CONTROLS
CORPORATION**

Series 3 Plus Extraction Controller

for Steam Turbines

Description

The Series 3 Plus Extraction Controller is specifically designed to regulate the LP header pressure or flow of a single extraction or induction turbine. It's the ideal complement to our *Series 3 Plus Speed Controller* [PB307]. Together, they provide integrated, efficient and reliable control for extraction steam turbines.

Through a sophisticated decoupling scheme, these two controllers coordinate the turbine's horsepower output and low-pressure flow rate, smoothly responding to changing application demands. They also cooperate to automatically sequence routine and emergency startups and shutdowns.

For steam turbine-driven compressors, the Speed and Extraction Controllers can be combined with our Antisurge and Performance Controllers to provide complete control of your rotating equipment train.

As with the Speed Controller, the Extraction Controller's redundant inputs, fault detection, fallback strategies, and redundant controller tracking features define a new, more economical approach to fault tolerance than has previously been available for steam turbines. And, like all Series 3 Plus devices, the Extraction Controller can be easily integrated into a distributed control system by using its Modbus-based serial communication features.

Alternate-Variable Extraction Control

For single turbine applications, the Extraction Controller can regulate the pressure or flow in the extraction header. Separate control loops are provided for both variables, each with its own tuning, inputs, and set point. The operator can bumplessly alternate between them at any time, without interrupting the process.

Depending on your needs and available measurements, the flow control loop can be configured to regulate either volumetric flow or temperature- and pressure-compensated mass flow.

The controller will accept set points for either loop from its front panel or a remote device. Again, the operator can switch between the local and remote set points at any time without disrupting the process.

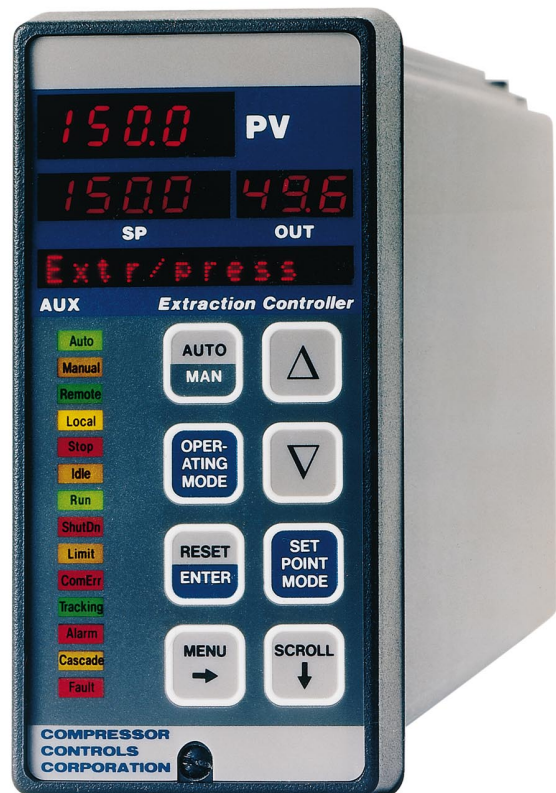
Description, continued on rear panel

Benefits

Series 3 Plus Extraction Controllers offer many benefits you cannot get from other systems, including:

- **More precise control of your process and steam balance** because our loop-decoupling algorithms provide coordination of interacting control loops
- **More reliable control** because redundant inputs and fallback strategies permit continued operation even after transmitter failures
- **Simplified operation** due to integral manual control capability, protective override, and automated start-up and shut-down
- **Less downtime and reduced maintenance costs** because electronic circuits are more reliable than mechanical and hydraulic components

Benefits, continued on rear panel



Description, continued from front panel

Extraction Load-Sharing

If you have several turbines connected to a single extraction header, load-sharing can be achieved by combining Series 3 Plus Performance and Extraction Controllers.

In most cases, this is implemented as a pressure-to-flow cascade. The Performance Controller monitors the header pressure, varying its output in response to any fluctuations. In turn, the Extraction Controllers use that output as a flow set point, manipulating the extraction valves to keep each turbine's contribution at an optimal level while matching the total flow to your process demands.

Summary of Features

The many built-in, keyboard-configurable features of the Series 3 Plus Extraction Controller include:

- control of header pressure or flow rate, with immediate, bumpless transfer between control variables
- header flow rate can be calculated as pressure- and temperature-compensated mass flow
- local or remote control of set points
- bumpless transfer among manual, automatic, remote, and local control modes
- integrated loop decoupling prevents interacting control loops from destabilizing your process
- manual operation with automatic override and loop decoupling allows direct valve positioning without endangering equipment or changing the variable left under automatic control
- input testing and fall back strategies keep your system on-line in the event of a transmitter failure
- tracking and self-test features for bumpless, automatic switching to redundant controllers in the event of a controller failure
- Modbus interface enables communications with host computers or distributed control systems
- automatic start-up and shut-down sequences that work with the Series 3 Plus Speed Controller to ensure safe, efficient start ups and shut downs
- compatible with pneumatic and hydraulic actuators
- standard hardware simplifies maintenance and spare parts stocking

Manual Control

When you need to directly manipulate the extraction valve, the Extraction Controller can also be operated manually. Your operator or DCS can then directly manipulate the intended position of that valve instead of the pressure or flow set point.

You'd normally run both the Speed and Extraction Controllers in automatic, but either or both can be switched to manual at any time. In the event that only one is being run manually, the loop decoupling scheme allows the other to precisely regulate its control variable despite any sudden manual movement of the other control valve.

In addition, the Extraction and Speed Controllers offer a manual override feature that prevents the operator from inadvertently moving the valves into positions that might cause damage to the turbine or disruption of the plant steam balance.

Control Valve Flexibility

In addition to 20 mA and 5 Vdc outputs, the Extraction Controller can also generate any current signal (up to 200 mA) required by pneumatic transducers or hydraulic actuators. For valves that require an external positioner, the controller can be ordered with a positioning loop that bases its output on deviations of a valve position signal from the desired value calculated by the control loop

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Benefits, continued from front panel

- **Lower turbine repair costs** because automated start-up sequence provides consistent warm ups and prevents operation at critical speeds
- **Lower control system costs** because Series 3 Plus systems provide integrated manual control and a more economical approach to fault tolerance
- **Lower capital costs** because automated start-up and overspeed protection prolongs the life of your turbine

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